

ADAPTIVE HEALTHCARE FRAMEWORK TO CLINICAL PATIENT MANAGEMENT IN GOVERNMENT HOSPITALS IN SRI LANKA

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ABSTRACT

Information technology plays a major role in developed sectors within society. Providing better and more accurate information to the health information system integration aims to improve the planning and management of health care. Healthcare is the most serious aspect of our society. This research is trying to introduce an adaptive framework with user-friendly interfaces for clinical patient management to homecare and smart clinical services in government hospitals in Sri Lanka. The use of Information systems with adaptive frameworks is most popular in current society in other countries but not in Sri Lanka. Scheduling clinic timetables for the patients, providing health tips, exercise tips to the patients, and conducting remote medical camps are based on the history of medical records, drug prescriptions, and background of the patient's health. This paper gives detailed information on the concept of adaptive healthcare and its components. This will be an innovative initiative to support clinical data in all public hospitals. Keeping this new technique of e-health, a framework for the implementation of an adaptive framework is also proposed based on the basic principles of adaptive healthcare.

Keywords—*Clinical Patient Management, Integrated Health Information System, Electronic Health Record,*

I. INTRODUCTION

Sri Lankan Health industry has a positive model of having good health at a low cost and it guarantees high-quality health care is provided to all the citizens in Sri Lanka[19]. Sri Lanka is a developing country whose poverty rate is a bit higher and most of the people could not afford to go to private hospitals they are considering cheap and reliable facilities from the government hospitals. The field healthcare industry enhances the entire patient management in the country through the use of technology. Keeping health information systems in public hospitals will solve many problems regarding the health records of patients. Patient information handling is a tedious task to maintain all their personal details, history of health, drug details, clinic info and lab details, etc. Using a single management system by integrating could replace the paperwork efficiently. Also, this would help the government agencies to analyze the status of their citizens in such a pandemic situation as Covid-19. Professionals in the healthcare industry can share patient data and the ability to provide continuity of care to the patient in real-time. The use of health information system (HIS) data has been well defined and well organized using a centralized model and can gain any specific patient information within the HIS.

II. LITERATURE REVIEW

Information systems began to be useful in the field of healthcare when people started using technologies and computers in various domains of medical industries. The term HIS (Healthcare Information Systems) emerged when a variety of information and communication technology advancements were employed in medical services.

Since the poverty rate is a bit higher in Sri Lanka, most of the patients take their treatment from public hospitals due to the cheap, affordable, and reliable facilities available there. In the healthcare industry, documentation handling from the beginning of patient admission record, exchange the records with the specific department or the counters to discharge records in most public hospitals documentation is handled on handwritten paper records which include filling and retrieving information.

According to Jayawardena [1], a computer-based electronic information system for the epidemiology unit in Sri Lanka was introduced with the collaboration of WHO in the year 2005 at Ampara and Hambanthota base hospitals. It was used to have paperless work and reduce cost and improve the accuracy of HIS. After that, it was expanded to selected six district public hospitals. Among them, District General Hospital in Trincomalee is successfully functioning with computerized HIS. Work on EHIS depends on computer literacy and the awareness of using electronic data in hospital information management.

In 2021, ICTA along with the Ministry of Health implemented a new system at Kegalle hospital in Sri Lanka. It improved the quality of the medical center's services. It provides patient registration, drug orders, injections, and summary report generations using HIS.

According to Haux [2], HIS can be described as technologies and applications used in health services, and that has some electronic background to give grounds for communication and transactions of health matters. The provision of healthcare services using mobile technology is

considered a technical advancement. According to Gartner [3], the use of HIS has enhanced accessibility, reachability, and the capability of performing operations effectively. Gartner's report has also shown some of the increasing cases of security issues associated with using electronic health records (EHRs). The descriptive ideas from Haux and Gartner basically show that HIS has its positive as well as negative sides.

The literature findings of m-Health studies showed the factors related to the usage of mobile systems in the health industry. It also showed the same factors as the ones in HIS studies. The efficiency of self, support, training, and personal innovativeness was recognized as one crucial factor in adopting mobile systems by medical practitioners [1,4,5]. Additionally, age and the type of hospital were also found to be influencing mediating aspects. From another worldview, in a study for caregiving by use of mobile system aid, it was discovered that outside cues to acts, innovativeness, ease of use, and usefulness are some of the influencing factors and it compels the healthcare practitioners to accept the use of HIS in the medical field [6].

The bottom-line of the reviewed studies showed similarities in m-Health and Health Information Systems domains and suggested more studies on investigating the influencing aspects and pointing out chief variables in various branches of medical services [6-9].

III. THE FRAMEWORK

To support the personalization of clinical patient management, the proposed framework model used in this study is shown in Figure 1. In the following section the different components of the framework are discussed.

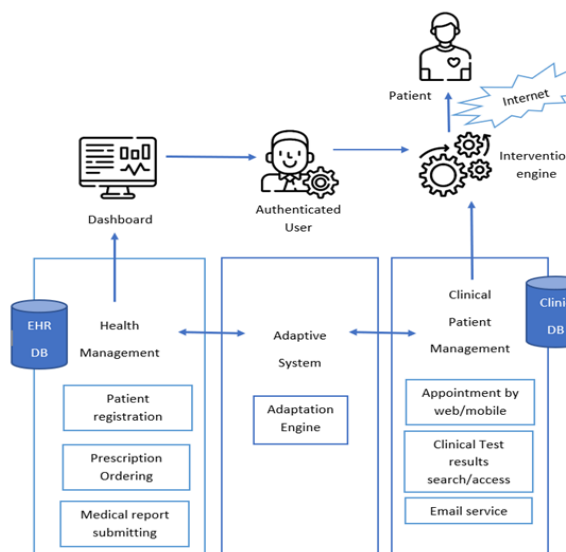


Fig.1. Adaptive Healthcare Framework for Clinical Patient Management

a. Adaptive engine

Use to evaluate patient data and suggests patient records to clinical patients DB

b. Dashboard

Allows access for medical staff, non-medical staff and patients with authenticated user access.

c. Intervention engine

Allows doctors or authenticated staff to send relevant clinic time tables to the patients based on their diagnosis. And conduct remote medical camps through the system.

IV. FACTORS INFLUENCING ADOPTION

The adaptive healthcare framework is shown in Fig.1. Based on the review, we have identified success and failure factors for clinical patient management (CPM) in government hospitals using

Health Information System adaptive process.

There are six categories of factors that decide the level of the adaptive framework, which can be high and low. By identifying failure factors one can mitigate the risk associated with the process. This research has identified all the common factors and classified them in order to conduct the research on Sri Lankan public hospital's health information systems.

There are 3 main categories identified Technology, Human and Organizational for this conceptual research frame.

There are five success factors categorized into organizational, behavioral, technical, ethical, and educational. Further another two failure factors are categorized as risk and resistance.

From human factors influencing the effectiveness of hospital information system adoption, we have received a mean score of 3.5, organizational and management variables received a score of 2.9, and technology factors received a score of 3.



Fig.2. Seven key categories of factors influencing success and failure of adaptive framework for CPM

V. PROPOSED ADAPTIVE HEALTHCARE FRAMEWORK WORKING SCENARIO

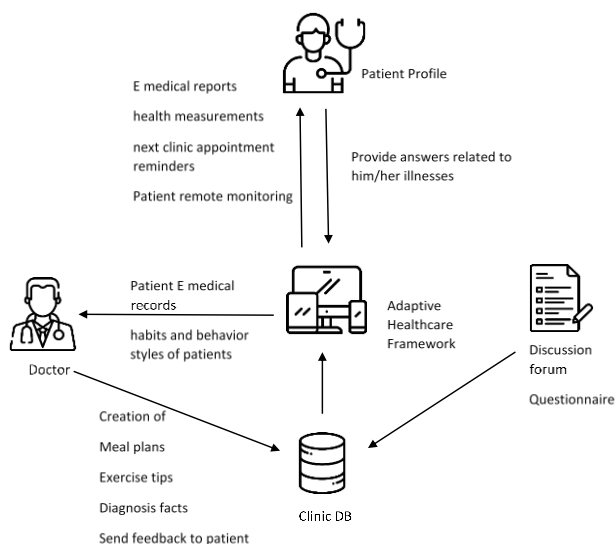


Fig.3. Adaptive Framework Working scenario

The working scenario of the framework is explained by the interaction with the system and by the use of electronic patient records. The Health Information system consists of the patient registration, prescription ordering, and medical report data which are stored in HIS DB. The patient model consists of patient information, clinical information, and clinical support systems. Hence the patient profile is created using clinic DB.

Inference of health condition of patients.

Adaptive healthcare framework displays patient's health level to both doctors and patients. By answering the questionnaire asked in the web portal each patient's habits and behavior styles are summarized and stored. An adaptive engine is used to evaluate patient data and to store patient records in clinical patients' DB. By use of this system, patients can access the health test results, and next clinic appointment reminders and can share the information with physicians.

Medical staff interaction

Medical staff, especially doctors' interaction with the system may be summarized as follows:

Doctors are able to add different results and diagnoses. The system facilitates the use of selected types of diagnosis methods, exercise tips, meal plans, and use of smart devices for checkups. Discussion forums and feedback facilities are also provided for an interactive clinical healthcare system.

The adaptive healthcare framework demonstrates patient health styles to the doctors or administrators. The doctor's ability to send feedback to the patients is based on observations and electronic medical reports. The intervention engine allows doctors or authenticated staff to send relevant clinic timetables to the patients based on their diagnosis. This would be really helpful to manage clinical patients' information and conduct remote monitoring and provide healthcare treatments.

VI. RESULTS AND DISCUSSION

Technology, Human and Organizational is the 3 main categories identified for the present adaptive healthcare framework. We further categorized five success factors namely organizational, behavioral, technical, ethical, and educational. In addition, two failure factors are categorized as risk and resistance.

From human factors influencing the effectiveness of hospital information system adoption, we have received a mean score of 3.5, organizational and management variables received a score of 2.9, and technology factors received a score of 3.

VII. CONCLUSION

The main objective of this research study is to implement the adaptive framework in healthcare. This system is implemented based on the success and failure factors we have observed.

Training of all of the staff in public hospitals could provide a better quality of service when using HIS. In the clinics, authorities have to focus on the quality of the service provided, such as reducing the waiting time in the queue, increasing patient satisfaction, and checking quality management to have the maximum quality of healthcare in public hospitals. From the findings, it is concluded there are seven factors involved and out of which five are success factors such as organizational, behavioral, technical, ethical, and education categories. The two failure factors are resistance and risk categories. Telemedicine services can also be used as remote monitoring technologies to improve patient health. Mobile devices can be used to access patient care.

By use of the SIM, users can access the health checkup results and next clinic appointment reminders and can also share the information with their physicians by having an adaptive framework. The patient who can not travel for the scheduled clinical appointments can use a real-time video communication platform with the use of video conferencing technology to meet doctors.

VIII. FUTURE RESEARCH

Further work can focus on extending the different outcomes of research conducted in this study. It is also planned to extend this study by incorporating the behavioral styles of the patients, meal planning, and exercise planning according to

the level of patient health. Other features such as connecting with wearable devices which would help to make better inferences about health will also be tried in the adaptive healthcare framework

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